

Planning Behaviour in Good and Poor Readers

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Abstract

A group of 50 good readers and a group of 50 poor readers of Grade 5 matched for age and intelligence and selected on the basis of their proficiency in reading comprehension were tested for their competence in word reading and the process of planning at three different levels, namely, perceptual, memory and conceptual in order to study the contribution of planning at these levels towards the reading achievement of children. Results of group comparison reveals that good readers were superior to poor readers not only in word decoding, but also in planning at memory and conceptual level. Results of correlational analysis, on the other hand, reveals a strong relationship of word decoding with planning at both memory and conceptual levels, while, reading compression showed a strong relationship with conceptual planning. The results have been discussed in terms of the neural basis of the three levels of planning process, the importance of use of task appropriate strategies for gaining mastery over the two skills of reading and suggestions have been made for their remediation.

Keywords: Reading skills, levels of planning cortical zones, reading remediation

1. Introduction

Reading is a highly complex cognitive activity that helps the reader to transform the visual graphic information into meaningful units of thought. Proficiency in reading thus, demands mastery over : a) word reading, i.e., decoding and b) reading comprehension, i.e., understanding the words in the context which are two different but interrelated skills of reading (Oakhill, Cain & Bryant, 2003). While decoding depends on adequate knowledge of letter-sound relationship as well as efficiency in phonological coding and retrieval, reading comprehension depends on the vocabulary knowledge, knowledge of syntactic and semantic structures of the written language as well as linguistic awareness of the reader. Reading, therefore, is a big challenge that children face as they begin to go to school. With proper instruction, of course, most children learn to read easily. But many others, who constitute the group of 'disabled' or 'poor' readers face difficulties in both word reading and reading comprehension or simply in reading comprehension, while their word reading and listening comprehension skills are intact. Within the frame-work of PASS model of intelligence, the skills of reading have been explained to be the function of four different, but interrelated cognitive processes namely, planning, attention, simultaneous and successive (PASS) processes (Naglieri & Das, 1988, 1990)

Deriving impetus from the clinical observations of Luria (1966, 1973, 1980), the PASS theory gives one of the most comprehensive account of human cognitive functioning in terms of three systems and four processes. The first system is the planning system, which involves executive functions (EFs) responsible for controlling, organizing, searching, goal-setting, selecting, constructing and executing plans or strategies, monitoring performance, evaluating the course of action and making decisions. It is a higher order cognitive process, a synthesizer of all intellectual operations and therefore, the essence of human intelligence (Das, 1984). The second is the attention system, which is responsible for maintaining arousal levels and alertness and ensuring focus on relevant stimuli, to the exclusion of irrelevant ones. The third system is information processing system which employs simultaneous and successive processing to encode, transform and retain information. Simultaneous processing is engaged when the relationship between items and their integration is required. Successive processing, on the other hand, is required for organizing separate items in a sequence.

The PASS theory postulates that each of the four processes occurs at three levels, namely, perceptual, memory, and conceptual which of course, are interdependent, but vary from one another with respect of the degree of abstraction involved in them. Perceptions are closest representations of objects and events, whereas, memory and conceptualization are a bit removed from direct apprehension through sense organs. Form this point of view a hierarchy in their arrangement may be assumed with perception at the bottom, conceptualization at the top and memory, in-between.

The PASS processes are carried out in three different blocks or units of the brain. Thus, attention is located in Block 1 that involves brainstem, the diencephalon and the medial regions of the brain. Coding is the function of Block 2 that includes parietal, occipital and temporal lobes, whereas, planning is carried out in Block 3 that entails the frontal, especially the pre-frontal areas of the cortex.

Studies have revealed the involvement of all the four processes in reading. In fact, attention plays a critical role in reading because it helps the reader to focus on relevant information for further processing. Successive processing which involves sequential processing of linguistic information helps in word decoding particularly at earlier grades, while comprehension, that requires processing of semantic and syntactic information depends on simultaneous processing at any level. Adopting appropriate strategies to read and

comprehend the text and use the information at the time of need, on the other hand, depends on planning. Hence, the ultimate level of reading achievement is determined by planning, the higher order cognitive process. (Das Naglieri & Kirby, 1994; Das, Parrila & Papadopoulos, 2000; Kirby et al., 1996; Mahapatra, 1990, 2015 Mahapatra & Dash, 1999).

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The discovery of planning factor is a significant achievement in the field of cognitive psychology. At one end, purpose and plans develop only after some mastery over language has been developed; at the other end, these seem to be the inherent characteristic features of human beings. Hence, in determining one's proficiency in reading, the unique contribution of planning is required to be studied thoroughly. The reading literature reveals that planning as a higher order cognitive process helps the reader to make decisions in adopting suitable strategies and monitoring as well as evaluating his/her course of action towards the attainment of the goal. But no study has yet revealed that whether planning operates at all the three levels in determining one's proficiency in reading, or its operation at some level(s) is more effective than the other(s). The present study was an attempt in this direction.

The purpose of the present investigation was to study the difference between good and poor readers with respect to planning at its three levels, i.e., perceptual, memory and conceptual and the relationship of the two skills of reading, i.e., word decoding and reading comprehension with the three levels of planning. It was excepted that good readers would differ significantly from poor readers with respect to their planning ability at all the three levels. Moreover, word decoding would show significant relationship with planning at perceptual and memory level, whereas, reading comprehension would relate significantly to planning at memory and conceptual level. Whether word decoding and reading comprehension would also relate to conceptual and perceptual planning was to be seen.

2. Method

2.1 Sample

The sample consisted of 50 good and 50 poor readers of Grade 5 selected from a population of 340 children of the same grade covering four odia medium schools in the city of Cuttack, Odisha. The mean grade level attained in terms of reading comprehension was 5.9 (about 1 grade above their actual grade) for the good readers and 2.9 (about 2 grades below their actual grade) for the poor readers, whereas all were normal with respect to their general intelligence, i.e., within 40th to 60th percentile of the intelligence score distribution as indexed by their performance on RCPM. The subjects had also no report of any neurological or psychiatric or other serious medical problems. The subjects were selected from both sex groups with a mean age of 10 years in each group and were from middle class families.

2.2 Tests

The good and poor readers were selected on the basis of their intelligence and reading competence as measured by Raven's Coloured Progressive Matrices and Graded Reading Comprehension Test respectively. Then each subject received the Oral Reading Test, a measure of word decoding skill and five different tests of planning, namely, Visual Search, Planned Connection, Matching Numbers, Crack the Code and Planned Composition designed to measure planning at its various levels. The tests, their administration and scoring procedures are described below.

Raven's Coloured Progressive Matrices (RCPM). This is a widely used culturally reduced test of intelligence for children aged 5 to 11 years. Consisting of 36 matrices or designs, each having a part which has been removed, the test requires the subject to choose the missing part from six possible alternatives. The 36 matrices are grouped into three series and each series is comprised of 12 matrices of increasing difficulty. Each correct identification carries a score of '1', Hence, the maximum possible score for the test is 36.

Graded Reading Comprehension Test. Developed by Mohanty and Sahoo (1985), this test is used for children of Grades 1 through 7. The test requires the subject to read some passages written in Odia on each of which some questions are asked. A score of '1' is given for each correct answer with the maximum score for the test being 86. The obtained score is then converted into a grade score. The test is discontinued following subject's failure to answer any of the questions for a passage.

Oral Reading Test. This is an Odia adaptation of Schonell's word Reading Test, which was used by Dash (1982). The test requires the subject to read aloud some words of varying complexity. He/she gets a score of "1" for each correct pronunciation. The maximum score for the test is 100. The test is discontinued with 10 consecutive errors, i.e., the incorrect pronunciations.

Visual Search. Consisting of 20 cards to measure automatic and controlled search this perceptual planning test requires the subject to identify and locate a target item within a box among other items in the surrounding field in each part of each card. The time taken by the subject to find out the targets in each card is recorded and its mean is calculated, which serves as the score of the subject on this test.

Matching Numbers. This test which measures planning predominantly at memory level requires the

subject to find and underline two identical sequences of numbers in a row of six sequences of numbers that vary in length across its three parts. The time limit for each part is two minutes. Score on the test corresponds to the number of pairs identified correctly. The maximum possible score for the test is 24.

Crack the Code. This conceptual planning task requires the subject to decode the principle and arrange some coloured chips in their correct order in a single trial observing some incorrect arrangements of these chips. Each correct arrangement of the chips made by the subject carries a score of "1". The test consists of six items and is discontinued after 2 consecutive failures. Each correct response carries a score of "1" and the maximum score is 6.

Planned Composition. This test, which measures planning predominantly at conceptual level requires the subject to write a story after seeing picture card. The picture card used in the present study was card No. 2 of the Thematic Apperception Test (TAT). The story written by the subject is rated by the investigator for 'expression', 'organization' and 'individuality'. The maximum possible score for each aspect is 7. Hence, the maximum possible score for the test is 21.

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2.3. Procedure

The tests were administered in Odia, the mother tongue of the subjects following establishment of adequate rapport with them and exposure to a few practice items. The subjects were tested individually in their respective schools, but in separate rooms provided by the Head-masters of the schools. The tests were administered in three different sessions following the instructions given in the test manuals. Thus, the tests of intelligence and reading were administered in the first and the second sessions respectively which were one day apart and the planning tests were administered in the third session. The order of the tests in these sessions was same as described in this section and was also balanced within the sessions. The subjects enjoyed performing on the tests.

3. Results

Keeping in view the objectives, the data were analysed by means of 't' test and correlational analysis. The results have been presented in separate tables.

The subjects were given the Oral Reading Test following their selection on the basis of their performance on tests of RCPM and Graded Reading comprehension. The means, standard deviations and 't' values in respect of these tests are presented in Table 1.

TABLE 1
**Means, standard Deviations and *t* values
Showing Group Differences on Measures of Intelligence and
Reading (N=50 in each group)**

Test		Good Readers	Poor Readers	<i>t</i>
RCPM	Mean	25.34	24.98	1.15
	SD	1.51	1.62	
Graded Reading Comprehension	Mean	70.00	32.52	20.18**
	SD	4.56	12.32	
Oral Reading	Mean	69.34	55.90	4.75**
	SD	11.74	16.20	

**P<.01

It may be seen from Table 1 that the two groups who were matched for their intelligence, differed significantly from each other with respect to their competence not only in reading comprehension, but also in word decoding which is a very basic skill of reading indicating subject's facility in lexical access. The correlation coefficients between word decoding and reading comprehension were 0.31, 0.33 and 0.51 for the good, the poor and the combined group of good and poor readers. All the correlations were significant indicating the relationship between the two skills of reading.

Both the good and the poor readers were then tested for their competence in planning at its three levels being administered the tests designed for the same. The means, standard deviations and 't' values in respect of these tests have been presented in Table2.

TABLE 2
Means, standard Deviations and *t* values showing Group Differences on Measures of Planning (N = 50 in each group)

Test		Good Readers	Poor Readers	<i>t</i>
Visual Search	Mean	10.37	9.99	0.63
	SD	3.20	2.72	
Planned Connection	Mean	37.51	37.76	0.11
	SD	10.23	12.61	
Matching Numbers	Mean	21.74	20.22	2.71**
	SD	2.25	3.27	
Crack the Code	Mean	1.24	1.34	0.59
	SD	0.84	0.86	
Planned Composition	Mean	12.26	7.26	7.43**
	SD	3.76	2.92	

**< .01

It may be seen from Table 2 that the good readers were superior to poor readers with respect to their performance on Matching Numbers and Planned Composition that measure planning at memory level and conceptual level respectively. The measures on which the two groups did not differ were Visual Search and Planned Connection, the two measures of perceptual planning and Crack the Code, the other measure of conceptual planning. The hypothesis framed in this correction thus, is partially supported.

The results of correlational analysis employed to examine the relationship of word decoding and reading comprehension with the three levels of planning are presented in Table 3 taking the performance of all the subjects into account.

TABLE 3
Correlation Coefficients for Measures of Reading and Planning (N=100)

Test	Visual Search	Planned Correction	Matching Numbers	Crack the Code	Planned Composition
Oral Reading	.05	-.00	.23*	-.10	.55**
Graded Reading Comprehension	.06	-.04	.17	-.12	.65**

*p<.05, **p<.01

It may be seen from Table 3 that Oral Reading the measure of word decoding correlated significantly with Matching Numbers and Planned Composition, whereas, reading comprehension showed significant relationship with Planned Composition. From correlational as well as group comparison analysis it has been clear that skilled reading involves planning at memory and conceptual level, but not at perceptual level. Word decoding, especially, appears to involve deployment of strategies pertaining to sequential memorization of grapheme, phoneme and application of grapheme phoneme correspondence rules in which the good readers were more proficient than their poor counterpart. Comprehension, which aims at extracting meaning from the text, on the other hand, involves deployment of strategies relating to conceptualization of meanings of words as well as the relationship among the words, the phrases and the sentences through organization and integration of the ideas associated with them.

4. Discussion & Conclusion

The present investigation was carried out with a purpose to study the difference between good and poor readers with respect to planning at its three levels, i.e., perceptual, memory and conceptual and the relationship of the two skills of reading with planning at these levels. Results revealed significant difference between good and poor readers in planning at memory and conceptual level. Word decoding, particularly was found to depend on planning at both the levels, while comprehension appeared to be solely a function of conceptual planning.

Reading and understanding the print is a highly complex cognitive activity that requires the appropriate interweaving of top-down, conceptually driven processes and of bottom-up, text driven processes (Rumelhart, 1977). The skilled reader, therefore, keeping in view the purpose of reading, develops his own plans and strategies of mastering the content of the text and becomes adept in the deliberate application of that knowledge in remarkably flexible ways. The more efficient and parsimonious the plan is, the more effective is the outcome. Skilled reading therefore is not just the strategic search of visual information, rather a strategic approach towards conceptualization, storage and meaningful integration of these information in attaining the goal. In fact, planning at memory and conceptual level appears to determine the reading achievement of children even at primary grade level as is evident in the present study.

The operation of planning process at its three levels and their contribution towards one's reading achievement may be explained in terms of its neural basis. Luria views that the PASS processes are carried out

in three different units of the brain, each having three cortical zones, primary, secondary, and tertiary, one after the other controlling the functions of the particular unit. The primary zone retains the modality characteristics of the information it receives which diminishes in the secondary zone. The information in the tertiary zone on the other hand, is typically amodal as it is responsible to integrate all information that has already been coded. Like the process of attention and coding, the operation of planning process at its three levels varying from one another with respect to the degree of abstraction involved in them, appears to be the function of the three cortical zones located within the cortical unit (the prefrontal cortex) controlling this process. Higher level mental operations determining one's proficiency in reading, thus, seems to be the product of functional efficiency of a structurally well-equipped brain.

Planning, like other PASS processes is mutable. Hence attempts have been made to bring improvement in these processes so as to improve the reading skills of children through a remedial programme called PREP (PASS Reading Enhancement Programme) which is based on the PASS theory of intelligence (Das, 1999). The programme, has been found to be effective both in western set-up and India. (Das, Georgioce & Janzen, 2001; Mahapatra, Das, Stack-Cutler & Parrila, 2010). In fact, planning ability improves through verbal medication or overt verbalization procedure (Kar, Dash, Das & Carlson, 1993). Knowing that skilled reading depends on planning more at memory and conceptual levels even at primary grade, attempt may be made to improve the reading skills of poor readers by improving their planning abilities at these levels. Hence, the earlier the problems are detected and remediation starts, better it is. This ultimately may give rise to a feeling of competence a desire for challenge and mastery in the skill and promote the psychological well-being of the child.

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